

## ULTRASONIC DIAGNOSTICS OF CYSTITES

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### ABSTRACT

*Cystitis most often develops at the age of 25–30 years, and also in women over 55 years old, i.e. after menopause. Up to 60% of visits to a urologist are associated with acute or recurrent cystitis [1, 2]. Cystitis is one of the most common urological diseases (according to statistics, the disease occurs in 1/5 of women on the planet). This is a purulent inflammation of the mucous membrane of the bladder with impaired organ function.*

**Introduction.** Most often, the causative agent of cystitis is a bacterial infection that penetrates the bladder through the urethra or from the inflamed upper genital tract or kidneys. The infection can be brought from other organs by blood flow and lymph.

A woman of any age can get cystitis, in some cases after sexual contact. Cystitis often affects adolescent females; in children and men, the disease is rare, and is usually associated with congenital pathology or urological disorders (bladder stones, tumors, prostate adenoma). Cystitis is inflammation of the bladder mucosa. In most cases, the cause of inflammation is a bacterial infection. The disease is manifested by discomfort in the projection of the bladder, frequent, painful urination with pain and burning, and sometimes blood in the urine. According to etiology, infectious (bacterial); non-infectious (medicinal, radiation, toxic, chemical, allergic, etc.). According to the course, cystitis is divided into acute and chronic (recurrent), which is divided into an exacerbation phase and a remission phase.

There are also primary (uncomplicated) cystitis (an independent disease that occurs against the background of a conditionally normal passage of urine in women 18–45 years old without concomitant diseases) and secondary (complicated) in all others, i.e. arising against the background of urodynamic disturbances and as a complication of another disease: tuberculosis, stone, bladder tumor, when the risk of lack of effect from empirically prescribed antibacterial therapy is increased.

According to the nature of the morphological changes, catarrhal, ulcerative-fibrinous, hemorrhagic, gangrenous and interstitial cystitis are possible [3, 4]. The latter is considered an independent disease in which a change in phases of the inflammatory process occurs, leading to severe pain in the bladder area, a gradual decrease in its capacity, up to wrinkling, and an increase in dysuria.

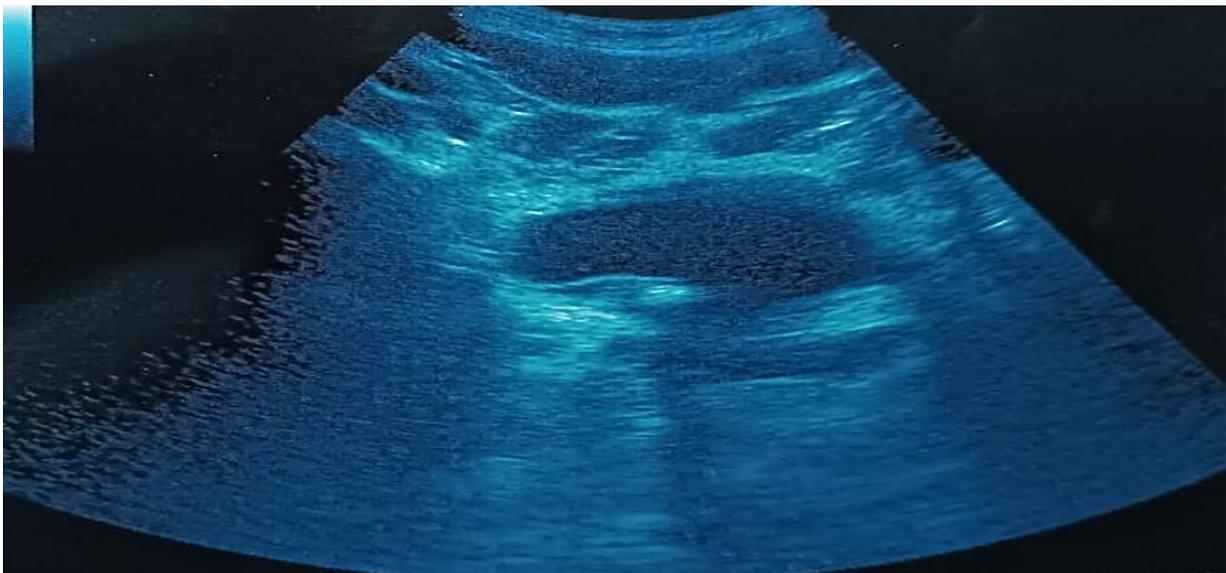
The latter develops against the background of concomitant diseases of the bladder (tumors, the presence of stones) or neighboring organs (chronic and acute genital infections, urethral stricture, prostate adenoma, cancer). Some patients experience lower back pain. A decrease in the ability to retain urine leads to the development of enuresis. Elderly patients experience urinary retention in the bladder. Cloudy urine and the presence of bloody spots in it are a symptom of hemorrhagic cystitis (destruction of the bladder mucosa), and mean a more severe course of the disease. If reflux occurs - the reverse penetration of urine into the urinary ducts, there is a risk of kidney infection.

**Diagnosis of the disease.** The bladder is a hollow organ located in the pelvis. Anatomically, the bladder is divided into apex, neck, fundus and body. The apex, the junction of the bladder with the middle vesico-umbilical ligament, is visible only when it is full. The fundus is the widest lower-posterior part of the bladder, facing the rectum in men, and the uterus and the upper part of the anterior vaginal wall in women. The neck is the narrowed part of the bladder, bordering the urethra. The middle section, located between the top and bottom of the bladder, is called the body. The bladder has a front, back and two side walls, passing into one another without clear boundaries. The bladder triangle of Lethe is formed by the orifices of the ureters and the internal opening of the urethra; its base is the intraurethral fold. The initial part of the urethra in men is covered by the prostate gland. The normal volume of the bladder in adults is 400-500 ml. The intravesical pressure is 10 cmH<sub>2</sub>O. Art. and remains relatively constant up to a volume of 350-450 ml, when an imperative desire to urinate arises, while the pressure rises abruptly to 30 cm of water. Art. The feeling of filling the bladder occurs with a volume of 100-200 ml, the first urge to urinate - with a volume of 150-250 ml [6]. Under pathological conditions, the capacity of the bladder can reach 1000-2000 ml. A physical examination of patients with cystitis reveals pain on palpation in the suprapubic region in the projection of the bladder. During a local examination of the perineum, the presence or absence of rashes on the mucous membrane is noted; condylomas; the location of the external opening of the urethra in relation to the anterior wall of the vagina, the presence of itching, vaginal discharge and the nature of the discharge (mucous; purulent; white, cheesy consistency, etc.). Rashes and genital warts on the mucous membrane of the perineum require the exclusion of the viral nature of the disease. Discharge and pain during vaginal examination are characteristic of diseases of the female genital organs (vaginitis, adnexitis, salpingitis, etc.). During a bimanual vaginal examination, attention is paid to the condition of the urethra (especially in patients with recurrent lower urinary tract infections), painful palpation of the bladder neck [5,7]. It is better to start the study with medium volumes, optimally with a volume corresponding to the first urge to urinate. Normally, this volume is 150-250 ml; its decrease or increase should suggest the presence of bladder dysfunction. Too small and too large volumes of the bladder make it difficult to visualize its walls and lead to unwanted artifacts. To conduct the study, the sensor is placed in the suprapubic region and longitudinal, transverse and oblique scanning is performed. The bladder is visualized as a cavity structure in the pelvis, filled with anechoic contents. Transabdominal examination provides excellent visualization of the posterior and lateral walls of the bladder, but examination of the anterior wall may be difficult due to the reverberant effects that occur in a filled bladder. In some cases, it is useful to use transducers with a higher scanning frequency (5-7 MHz) to examine the anterior wall and apex area. The walls of the bladder are normally smooth, symmetrical, and have a layered structure, which is

determined by the presence of mucous, muscular and adventitial layers. The thickness of the walls of an empty bladder does not exceed 5 mm, a filled one - 3 mm and does not depend on the age and gender of the subject [8,10].

There are no contraindications to ultrasound for cystitis. This is a diagnostic method that is safe for the body and has no side effects or complications. However, scanning cannot replace other diagnostic methods, such as urine tests, bacteriological examination, and cystoscopy. Ultrasound of the bladder allows you to determine: diverticula (protrusion in the wall of the bladder) and the presence of inflammation in them, tumors (polyps, cancer), acute and chronic cystitis. Preparing for an ultrasound of the bladder: Ultrasound diagnosis of the bladder is performed with a full bladder. When preparing for an ultrasound of the bladder, it is important to drink 30–40 minutes before the examination, 200–800 ml of non-carbonated liquid, enough for the doctor to get a clear image on the monitor of the volume of residual urine. You cannot eat directly on the day of the test, so it is usually prescribed in the morning. If you are scheduled for an examination during the day or evening, your last meal should be no later than 6-8 hours before the ultrasound. In women, the scan is performed through the surface of the abdominal wall using an external probe. Transrectal method - a rectal sensor is inserted through the anus into the patient's rectum. Ultrasound examination is carried out through the thin wall of the intestine. During a transabdominal examination of the bladder, the patient is on the couch lying on his back, freeing the lower abdomen from clothing. Ultrasound doctors apply a special gel and examine the lower part of the abdominal cavity with a probe. With a bladder polyp, polyps and tumors of the bladder and ureters, disturbances in the structure of the ureters, stones of the bladder and ureters are clearly visible.

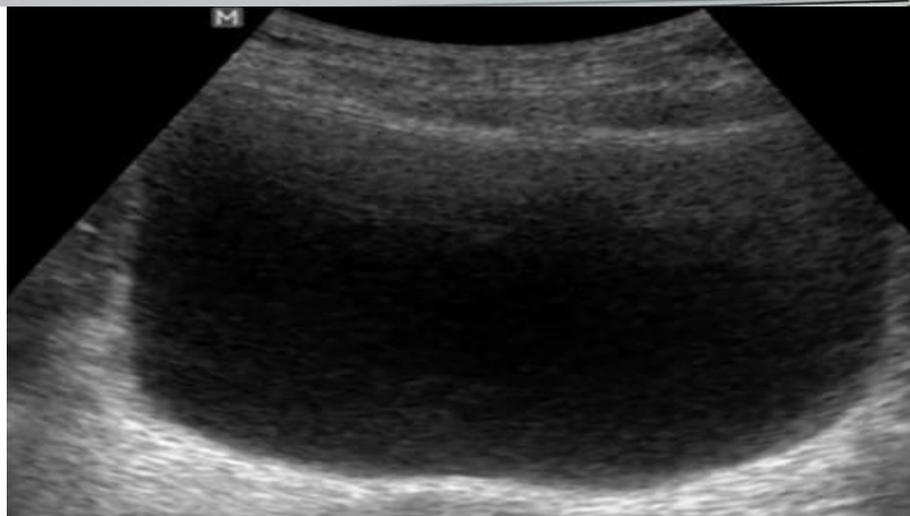
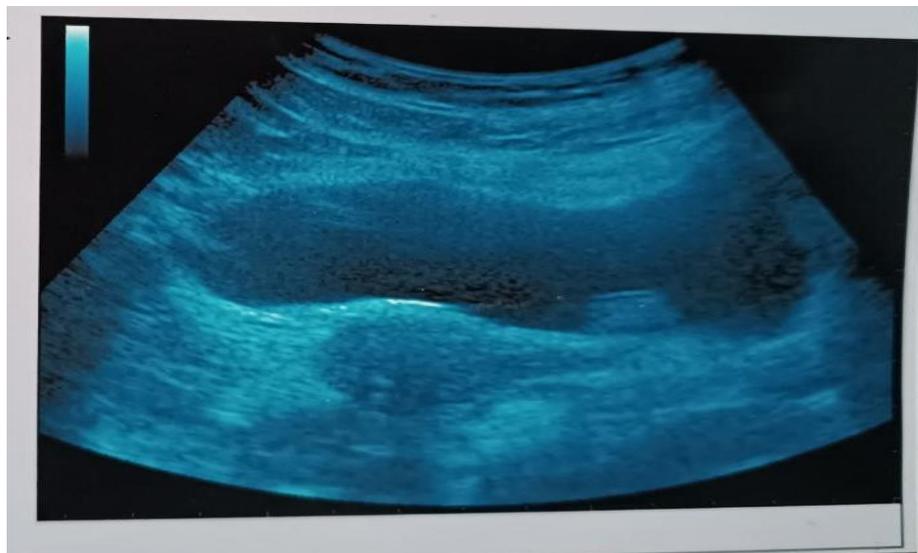
**Material data.** In an outpatient study, 47 patients were selected, of which 39 were women with cystitis. In 8 sick men, an ultrasound examination determined in one case a tumor of the bladder, in two cases prostatitis, in the remaining cases in 4 patients cystitis was associated with urolithiasis, in two cases a stone at the mouth of the ureter.



*Fig-1. Right ureteric orifice stone*

Among women aged 17-27 years, 11 women, 28-40 years old, 13 women, 40-60 years old, 15 women were diagnosed with cystitis, among 40-60 years old there were complicated cystitis in which 11 cases of diabetes mellitus.

*Fig-2. Bladder tumor*



*Fig-3. Cystitis*

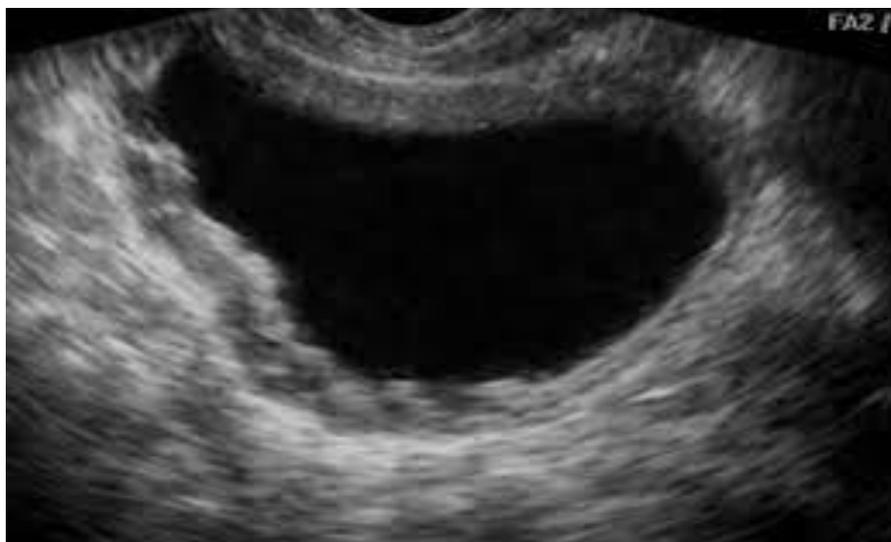


Fig-4. Cystitis in a patient with diabetes mellitus

**Conclusion.** Symptoms of acute cystitis, due to their low specificity, require careful differential diagnosis, primarily with infectious and inflammatory diseases of the vagina and non-infectious urological diseases. Acute uncomplicated cystitis is a manifestation of an acute infection of the lower urinary tract, which is limited only to the bladder. These infections do not have signs or symptoms that indicate an infection extending beyond the bladder. Ultrasound diagnostics is the optimal technique for diagnosing cystitis.

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